



Lesson 3

Brazil coast

From Tropical Forests to Icy Glaciers

The dramatic topography of Latin America results in a diversity of climates over a relatively small area. In this lesson students learn how to identify different climates in Mexico, Central America, and South America and create a map showing the climates of the region.

Students listen to a guided visualization that takes them from the coast of South America over the Andes to the western edge of the Amazon rainforest. During this activity students picture the change in elevation, “feel” the changes in

temperature and get a glimpse of how these factors affect vegetation along the visualized route. They use this information to build an understanding of how topography influences climate diversity in the region.

The information in this lesson

links the previous lesson on regional landforms with the following on biodiversity. As students complete this lesson, they will be able to differentiate among the different climate zones of Mexico, Central America, and South America.

Learning Objective

Differentiate among the climatic zones throughout Mexico, Central America, and South America.



Background

The area where the Maya, Aztec and Inca cultures flourished sits entirely within the tropics. Because the word “tropical” tends to conjure images of steamy forests and sunny beaches, students may be surprised to learn that these regions experience virtually every climate and weather condition on Earth.

Temperatures vary widely throughout this region. Both land and sea masses and elevation influence atmospheric temperature. At lower elevations, Earth’s surface temperature affects the air

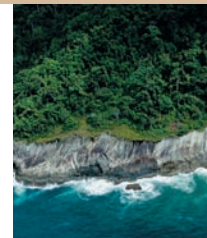
temperature; as altitude increases, temperature decreases.

Off the coast of eastern South America the warm waters of the Atlantic evaporate and the moist air carried over the Amazon Basin by trade winds keeps the area warm and humid. In the west the cold water causes moisture in the air to condense directly over the ocean’s surface, forming chilly fog.

The towering Andes separate South America’s eastern and western coasts and create a rain shadow. Moisture from the warm Atlantic air rises and releases over the high peaks, leaving little or no moisture to fall on the leeward side of the range. The diversity in temperature and rainfall pattern varies so greatly across this landscape that climate-induced permanent glaciers, moist evergreen jungles, dry grasslands, and hot arid deserts exist within fewer than 100 miles (161 kilometers) of each other.

In Central America and Mexico, lower mountains separate the Caribbean and Pacific coasts, causing less dramatic variations that support tropical forests, pine-covered mountain peaks, and seasonally dry Pacific coastal forests. Within the mountains each peak and valley experiences variations in rainfall and temperature. Because of the large climatic diversity in these mountainous areas, large-scale maps often ambiguously label the climate here as “montane.”

South America stretches into the temperate zone, with the southern cone of the continent displaying climates similar to those of North America. A forest of four distinct seasons grows in the east, grassland (pampas) stretch across the middle, and a California-like Mediterranean climate falls along the continent’s western coast. This coast in turn resembles North America’s Pacific Northwest with a maritime climate further south that terminates in the tundra of Tierra del Fuego.



Key Vocabulary

Equator: An imaginary line equidistant from the poles and perpendicular to the axis of Earth’s rotation.

Leeward: The direction downwind from a geographic feature or object such as a ship.

Montane: Pertaining to, growing in, or inhabiting mountainous regions.

Rain shadow: An area with little precipitation that lies on the leeward (downwind) side of a mountain.

Transect: A line or a strip of vegetation that cuts across a particular area, used for study purposes.

Tropics: The region of the earth between the tropics of Cancer (23°27' N latitude) and Capricorn (23°27' S latitude).

Weather: State of the atmosphere (temperature, moisture, wind and other atmospheric conditions) at a given time and place.



Rain on plant in rainforest

Toolbox



Summary of Activities

Students create a climate map of Mexico, Central America, and South America. They listen to a guided visualization that takes them from the Pacific coast across the Andes to the Amazon to learn about how landforms and elevation influence the climates of this region.



Instructional Support

See Extensions & Unit Resources, pages 32–33

Prerequisite Knowledge



Students should know about:

- the influence the ocean has on the weather and note the role that water cycles play in weather patterns.
- how the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, climate, and soil composition.

Advanced Preparation

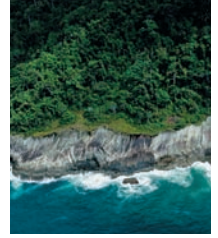


Gather and prepare Activity Masters.

Gather and prepare Materials Needed.

Gather and prepare Visual Aids:

- Prepare transparencies.



Materials Needed



Activity supplies:

- several atlases showing countries of Latin America and the location of the equator and the tropics

A-V equipment:

- Overhead or LCD projector, screen

Class supplies:

- one set of colored pencils or markers for each group of four students

Visual Aids



Transparencies:

- **Latin American Climates**, Visual Aid #10

Duration



Preparation Time

20 min.

Instructional Time

55 min.



Safety Notes

None

Activity Masters in the Supporting Materials (SM)

Latin American Climates

SM, Page 36
One per student

Overview of Latin American Climates

SM, Pages 37–38
One per group

Climate Visualization

SM, Pages 39–40
One per teacher

Procedures

Vocabulary Development

Use the **Key Unit Vocabulary** (Lesson 1 Activity Master) to introduce new words to students as appropriate. This vocabulary sheet will be used throughout the unit.

Step 1

Write the terms “climate” and “weather” on the board and ask students to distinguish between them. Write student ideas on the white board and discuss as a class. Emphasize that climate represents average weather patterns (day-to-day conditions of a particular place) over a long period of time. For example, although the weather in Palm Springs on December 15 may be cool and drizzly, the city sits in a desert climate zone characterized by fewer than 10 inches of rainfall a year.

Step 2

Organize students into groups of four. Give each student a blank map of **Latin American Climates** (Lesson 3 Activity Master) and give each group a copy of **Overview of Latin American Climates** (Lesson 3 Activity Master).

Step 3

Project the transparency of **Latin American Climates** (Visual Aid #10) and show students the lines of latitude for the equator, the Tropics of Cancer, and the Tropic of Capricorn. Have students add these lines and labels to their maps of **Latin American Climates**. Explain that these lines of latitude form the boundaries of the area called the tropics, where days last about 12 hours throughout the year. Emphasize that the farther an area sits from the tropics, the more extreme the difference in temperature and number of hours of sunlight between summer and winter.

Step 4

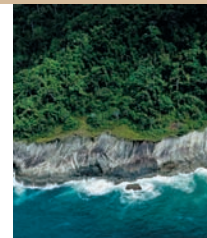
Have students color their maps of **Latin American Climates**. Tell students that each area with a number on the maps should be filled in with the color indicated on the transparency. Explain that each number represents a different climate zone present in Latin America.

Step 5

Ask the class, “What images come to mind when you hear the word ‘tropical?’” Call on a few students to share their responses. Explain that although the day length in the tropics stays basically the same throughout the year, students will notice on their maps that a variety of climates exist in this region. Ask students, “Why are climates so varied here?” (*Variation in elevation, distance from the ocean, and temperature changes due to nearby ocean currents, and diversity of soil types.*)

Step 6

Refer again to the transparency of **Latin American Climates**. Point out the starting point on the Pacific coastline of Ecuador near the Equator at 2° Latitude and the end point at the headwaters of the Amazon River in the rainforest.



Step 7

Read the narrative of **Climate Visualization** (Lesson 3 Activity Master). Explain that this story takes students from the coast of Ecuador, up to the glaciers of the Andes Mountains, and over into the Amazon Rainforest. During this journey students should listen carefully to information about the weather, climate, elevation, and vegetation.

After reading the story, ask students, “What differences in temperature did you notice between the higher elevations and the lower elevations?” (*The high elevations are cold. The lower elevations are hot.*) Ask them, “How did changes in elevation and distance in miles from the Pacific Ocean affect the amount of moisture?” (*The areas in the east are wet. The areas in the west are dry.*)

Step 8

Project the transparency of the map of **Latin American Climates** and show students that the transect cuts through climate areas 1 (Tropical, Wet), 2 (Tropical, Wet, and Dry), 4 (Arid) and 9 (Montane). Tell students that because of the many variations in climate over small areas in mountains, many different climates may be represented simply by the term “montane.”

Step 9

Explain to students that they have learned about many mountainous regions throughout Mexico, Central America, and South America. Remind students that variations in elevation and other factors contribute to a diversity of climates. Ask students, “Why does the rain shadow affect the amount of moisture that falls on either side of a mountain?” (*While one side is wet, the other side has little precipitation because the mountain forms a geographical barrier to the moisture.*) Explain that a rain shadow occurs between the wet western Sierra Nevada and the dry eastern Sierra in California as a result of the same geographical effect.

Step 10

Collect maps and score them according to the Answer Key in the Lesson Assessment section, page 75. Return work to students and remind them to add it to their unit folders.

Lesson Assessment

Description

Lesson 3 teaches students how to differentiate among the climate zones in Mexico, Central America, and South America. In Steps 3 and 4 students reveal their understanding of the different climatic zones as they create a map that shows the distribution of these zones, the equator, and the tropics of Cancer and Capricorn on their maps of **Latin American Climates** (Lesson 3 Activity Master). Through class discussions, in Steps 7 and 9 students demonstrate their understanding of how topography influences the diversity of climates in the region.

Suggested Scoring

Use the Answer Key on page 75 to score **Latin American Climates**.

Score as follows: correct placement of the equator and the tropics of Cancer and Capricorn (5 points each); correctly colored and labeled climate types and key (5 points each). This assignment is worth a total of 60 points.

Answer Key and Sample Answers

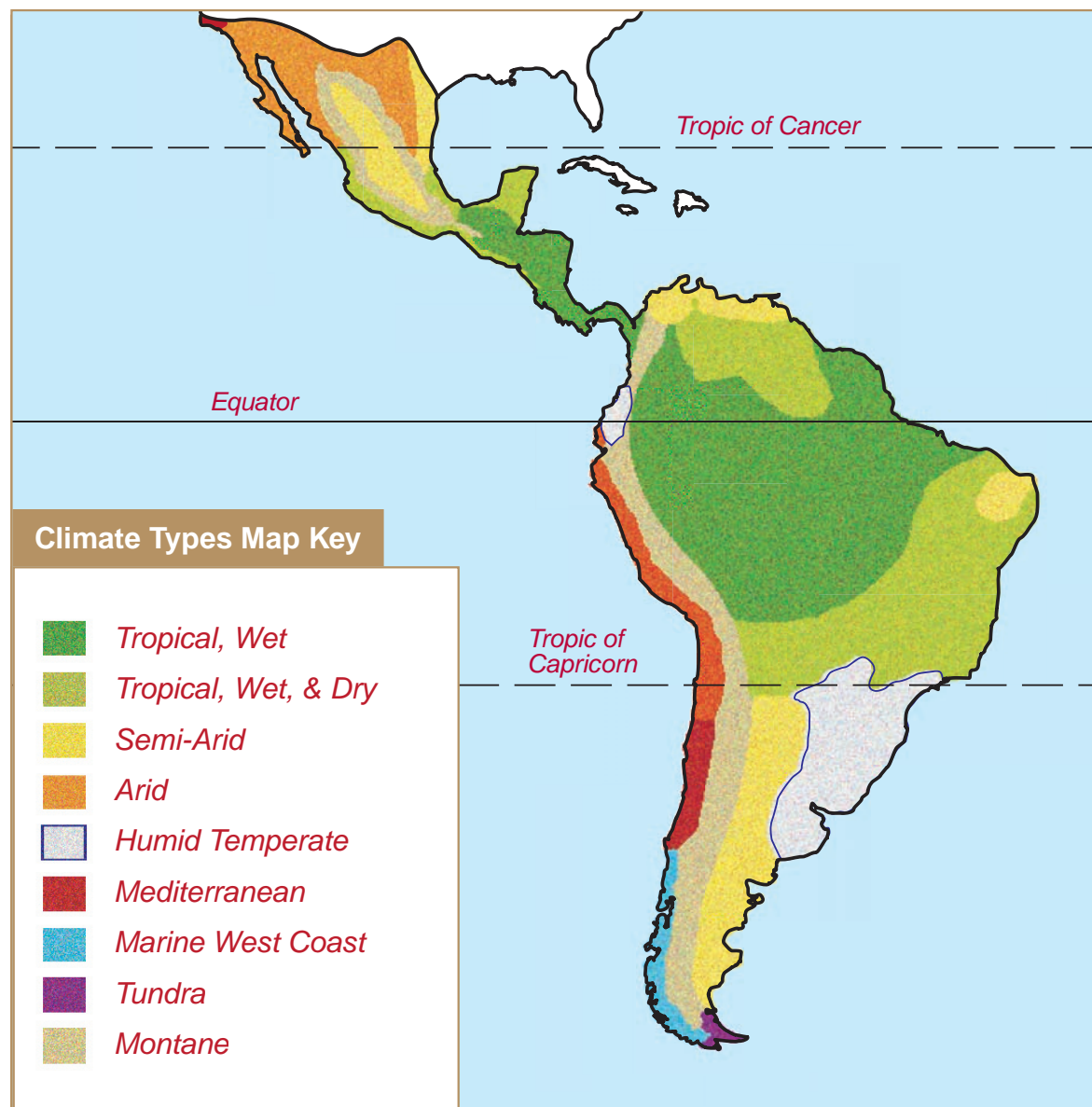
Latin American Climates

Lesson 3 Activity Master

Name: _____

Instructions:

- Insert the following on the map: Equator, Tropic of Cancer, and Tropic of Capricorn.
- Use the map key provided on the transparency Latin American Climates as a guide as you identify and color the various Latin American climates.
- Complete the Climate Types Map Key.



Overview of Latin American Climates

Lesson 3 Activity Master | page 1 of 2

Tropical Climates: 0°– 30° Latitude

Tropical, Wet

These areas are wet all year. They receive at least two inches (60 millimeters) of rain per month and up to 260 inches (600 centimeters) per year. Temperatures are always warm at 64°F (18°C) or higher. This climate supports tropical rainforests and occurs over the Amazon Basin in central Brazil, eastern Colombia, Peru, Ecuador, and Bolivia. This climate also exists in the forests on the Caribbean side of Central America.



Rainforest

Tropical, Wet, and Dry

These areas have a dry season during the winter months. During the driest month fewer than two inches (60 millimeters) of rain fall, with a maximum of 20–70 inches (50–175 centimeters) of rainfall throughout the year. Seasonally flooded grasslands or dry forests occur in areas with this climate type. This climate type is one of the most common in Latin America. It covers a large portion of Bolivia, Venezuela, Colombia, and southern Brazil. It also occurs in most of Southern Mexico and along the Pacific coast of Central America.

Semi-Arid

These areas tend to be grasslands. Between 10 and 20 inches (25–50 centimeters) of rain falls in this climate type per year with only slight variation in daily temperatures. The pampas of central Argentina, the grasslands of central Mexico, and northern Venezuela all experience this climate type.

Arid

Fewer than 10 inches (25 centimeters) of rain fall in arid climate types each year. This climate type sees a wide variation in daily temperatures, with differences between day and night ranging over 50°F (10°C) or more. Deserts form along the Pacific coast from central Chile to Ecuador. They also develop in southern Argentina and northern Mexico.



Arid

Overview of Latin American Climates

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Mid-Latitude Climates: 30°– 60° Latitude**Humid Temperate**

These areas have distinct seasons with cold, dry winters and warm, wet summers. Most of the eastern United States has this climate type, which also occurs in Uruguay, Paraguay, and most of Argentina. Approximately 32 inches (81 centimeters) of precipitation falls here each year. Temperatures range from higher than 90°F (18°C) in the summer to below freezing in winter.

Mediterranean

Summers in these areas are hot and dry and winters mild and wet. Approximately 17 inches (42 centimeters) of rain falls here each year. Temperatures range from near freezing in the winter to higher than 90°F (32°C) in summer. This climate type occurs across much of California. In South America it occurs only along the central coast of Chile, near Santiago.

Marine West Coast

This climate occurs where cold ocean currents run along the coast. This pattern creates relatively mild temperatures that average around 60°F (16°C) and holds moisture year-round. As many as 100 inches (125 centimeters) of rain falls here per year, with most of the rain falling in winter. California's coast redwood forests occur in this climate. In Latin America, this climate spans the southern coast of Chile.

Polar Climates: 60°+ Latitude**Tundra**

The tundra experiences a cool climate, ranging from 10°F to 50°F (-12°C to 10°C). Only a small amount of precipitation, 20 inches (50.8 centimeters) or fewer, falls here each year. This climate occurs at the very southern tip of South America.

Any Latitude**Montane**

Montane areas see a wide diversity of different climates over a small area. This climate occurs in the Andes that run along the length of western South America and in the Sierra Madre that rings central Mexico.

*Montane*

Climate Visualization

Close your eyes. You are about to embark on a journey that will take you through some of the most incredible landscapes on Earth. So relax and get ready for the trip of lifetime. Take a deep breath and feel your body slowly floating upward. You are moving south along the rugged coastline. South from California all the way to South America, to the equator itself.

Breathe through your nostrils and smell the salt air. Now you are on the cool Pacific coastline of Ecuador. Behind you, across hundreds of miles of open ocean, are the islands of the Galapagos. In front of you is a rocky shore battered by waves. Here, the warm Panama Current meets the freezing cold waters of the Humboldt Current, which sweep north from Antarctica. This meeting of the currents creates a rich marine environment teeming with fish. You packed a fishing pole, so you take a while to sit on the cliffs and angle for a bite. Luckily, you brought a full water bottle. Fewer than 29 inches (50 centimeters) of rain fall here over the entire year. As you sit, you keep your sweatshirt on; the temperatures are cool along the ocean as they hover around 65°F (18°C).

You pull off your sweatshirt as you travel slightly further inland. Dry grass rustles underfoot and many of the trees here are leafless. You are in the dry forest of the Ecuadorian coast. You take a drink from your water bottle. Only 20 to 40 inches (51 to 102 centimeters) of rain fall in this region and most of it drops during the rainy season (from June through October). You're beginning to sweat, since it is over 90°F (32°C) during the day here for most of the year; it drops to 70°F (21°C) at night.

Time to get to somewhere cooler and you know just where to go. In front of you, you see the towering peaks of the Andes, the second highest mountain range in the world. As you start up the mountains, things change quickly. The air gets cooler and wetter. The dry forest gives way to green ferns and waterfalls. At just about 5,000 feet (1,524 meters) above sea level, you see fields of corn and coffee all around you. You pull out your umbrella as an afternoon storm starts. There's a moderate amount of rainfall here, about 20 to 100 inches (51 to 254 centimeters). Right now it's still pleasant, about 75°F (24°C). But you are glad you brought a jacket, because it will drop below 50°F (10°C) tonight. The mild temperatures and year-round rain here make it a perfect place for people to live, a land of eternal spring.

As nice as it is in these green valleys, you cannot resist going up toward the snow-covered peaks in front of you. As you go higher, the forests get thinner and thinner. You walk among thick bunches of grass, where herds of furry alpacas graze in the bright sunlight. Here in the Andean Altiplano (ahl-tea-plah-no) temperatures stay cool all year-round, at an average of 45°F (7°C). It is harder for you to hike up here at 10,000 feet (3,048 meters), because there is less oxygen

Climate Visualization

Lesson 3 Activity Master | page 2 of 2

*Snowy mountain*

in the crisp air. You put on your hat and stuff your hands into your pockets to warm them.

You continue even higher, until all vegetation disappears, and snow and ice crunch under your feet. You are now higher than 16,000 feet (4,877 meters), on the glaciers that cover the high Andes. You pull down the earflaps on your hat and wrap a scarf around your neck—the dry, freezing cold air whips over the mountains and makes you shiver. It is the frigid conditions here that preserved Inca mummies for hundreds of years on these high peaks. You look out to see nothing but vast, sharp, white and gray mountains all around. Here, any moisture still left in the clouds gathers as ice or snow and temperatures stay below freezing all day. You cannot believe it is so cold here right on the equator. To think that before this trip you thought tropical places were all hot!

You see a huge bird circling overhead—it is an Andean condor—and with it you plunge

over to the eastern side of the mountains. You fly over grassy altiplano and see misty wet forests covering the slopes below. As you drop to lower than 2,000 feet (610 meters) in elevation, you see that the eastern side of the mountains is different from the dry western coast. Flocks of red and blue squawking macaws fly over what looks to be an endless forest, and below you hear the calls of monkeys and smell the sweet aroma of orchids. You are now in the headwaters of the Amazon, where it rains almost daily, up to 250 inches (6 meters) per year. The combination of moist air and tropical latitude means it is as warm at night as it is during the day, about 80°F (27°C).

Now it is time for your journey to end. Nobody at home will believe all of the different climates you have seen over just 250 miles (402 kilometers). That is less than the distance between Monterey and Los Angeles.

Latin American Climates



